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IN THE UNAITED STATES PATENT AND TRADEMARK OFFICE

APPLICANTS	:	Minoru Mukaida
SERIAL NO.	:	09/740,345
FILED	:	December 18, 2000
FOR	:	ENERGY CONSUMPTION EFFICINCY IMPROVING AGENT AND METHOD, AND ARTICLE HAVING IMPROVED ENERGY CONSUMPTION EFFICINCY
ART UNIT	:	1773
EXAMINER	:	Rickman, Holly C.

Supplemental Declaration under Rule 1.132

I, the undersigned declarant, hereby state as follows:

I am one of the named inventors in above-referenced application.

I am a Japanese citizen residing at Shinagawa-ku, Japan.

I conducted the experiments set forth in detail in the following description, and I submit this declaration in support of the above-referenced application.

ADDITIONAL EXPERIMENTS

(Improving Effect of Fuel Consumption by the thickness of the film)

The inventor has conducted an experiment, which shows the fact that when a thin film having a low viscosity is attached to the ground contact surface of a tire, the increase of the ground contact frictional force against a load surface is changed into an energy transmitting force (a force used for rolling the tire), which improves the energy consumption of vehicles; while the critical point, where the increase of the rolling resistance (the increasing of hysteresis loss or adhesion) due to the thickness of the film, which makes the energy consumption worse, exceeds the rate of the increase of the friction, is 10μ m.

Ⅰ. Difference of the ground contact frictional force due to the thickness of the film attached on the surface tire (A model vehicle was used for the experiment).

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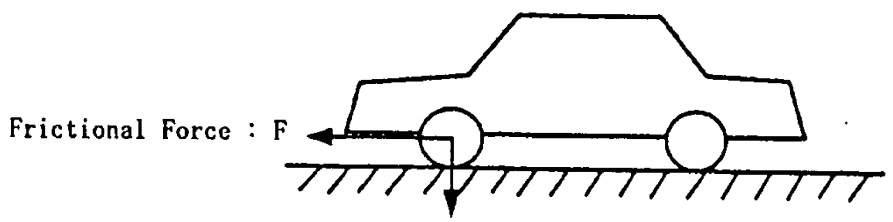
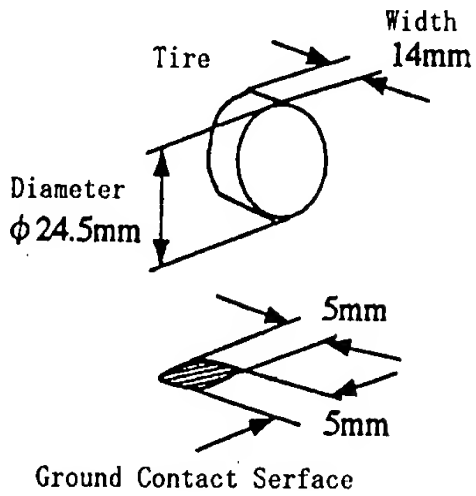


Load against the driving tires W=185g
(The driving tires are locked)

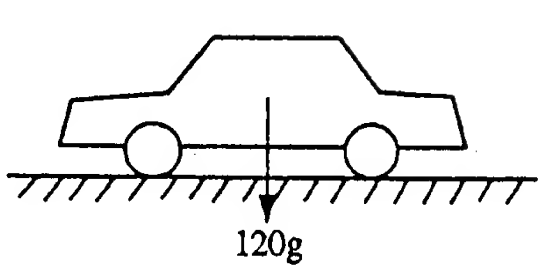
$F=\mu W$

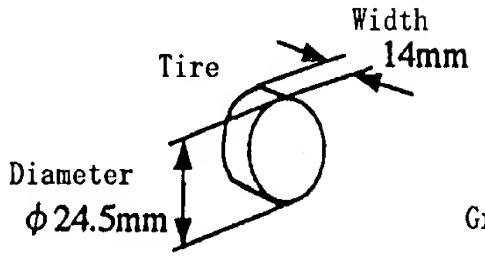
F: Frictional Force
μ: Frictional Constant
W: Load against the driving tires

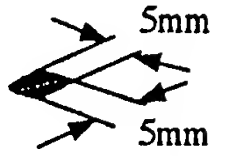


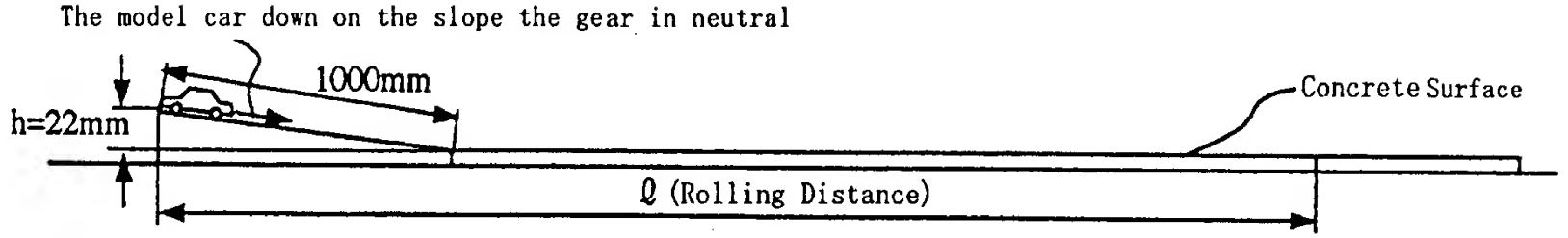
	Thickness of Film on the Driving Tires													
	0 μm (without film)	0.01 μm	0.2 μm	0.5 μm	1 μm	5 μm	10 μm	20 μm	30 μm	40 μm	50 μm	75 μm	100 μm	105 μm
Ground Contact Frictional Force : F	120g	160g	152g	150g	149g	145g	140g	134g	127g	121g	115g	104g	92g	90g
Ground Contact Frictional Constant: μ	0.65	0.85	0.82	0.81	0.81	0.78	0.75	0.72	0.69	0.65	0.62	0.56	0.50	0.48
Increasing rate of Frictional Force (Comparison to the tire without film)	—	33.3% increased	27.0% increased	25.0% increased	23.8% increased	20.8% increased	16.7% increased	11.5% increased	6.2% increased	1.0% increased	4.2% decreased	13.2% decreased	23.7% decreased	25.0% decreased

Ⅱ. Difference of the rolling resistance due to the thickness of the film attached on the surface of tire (A model vehicle was used for the experiment).









$\left[v=\sqrt{2gh},\ 1/2 \times vt = \ell\ (t : \text{moving time}) \right.$
$\left. \text{Rolling resistance } R=m \times dv/dt,\ \text{Mean Deceleration } b=dv/dt \right]$

	Thickness of Film on Tires													
	0 μm (without film)	0.01 μm	0.2 μm	0.5 μm	1 μm	5 μm	10 μm	20 μm	30 μm	40 μm	50 μm	75 μm	100 μm	105 μm
Rolling Distance : ℓ	4280 mm	4076 mm	3920 mm	3873 mm	3837 mm	3754 mm	3669 mm	3510 mm	3334 mm	3170 mm	3024 mm	2767 mm	2585 mm	2550 mm
Rolling Resistance : R	0.0126 kgf	0.0132 kgf	0.0138 kgf	0.0139 kgf	0.0141 kgf	0.0144 kgf	0.0147 kgf	0.0154 kgf	0.0162 kgf	0.0170 kgf	0.0178 kgf	0.0195 kgf	0.0209 kgf	0.0212 kgf
Mean deceleration : b	50.4 mm/s^2	52.9 mm/s^2	55.1 mm/s^2	55.7 mm/s^2	56.3 mm/s^2	57.5 mm/s^2	58.8 mm/s^2	61.5 mm/s^2	64.7 mm/s^2	68.1 mm/s^2	71.3 mm/s^2	78.0 mm/s^2	83.5 mm/s^2	84.7 mm/s^2
Increasing rate of Rolling Resistance (Comparison to the tire without film)	—	5.0% increased	9.3% increased	10.5% increased	11.7% increased	14.1% increased	16.7% increased	22.0% increased	28.4% increased	35.1% increased	41.5% increased	54.8% increased	65.7% increased	68.1% increased

Ⅲ. Improving Rate of Fuel Consumption (Experimental Result Ⅰ + Ⅱ) — Solid Line Curve of Figs.1, 2

Fig.1 Relation between Improving Rate of Energy Consumption and Film Thickness

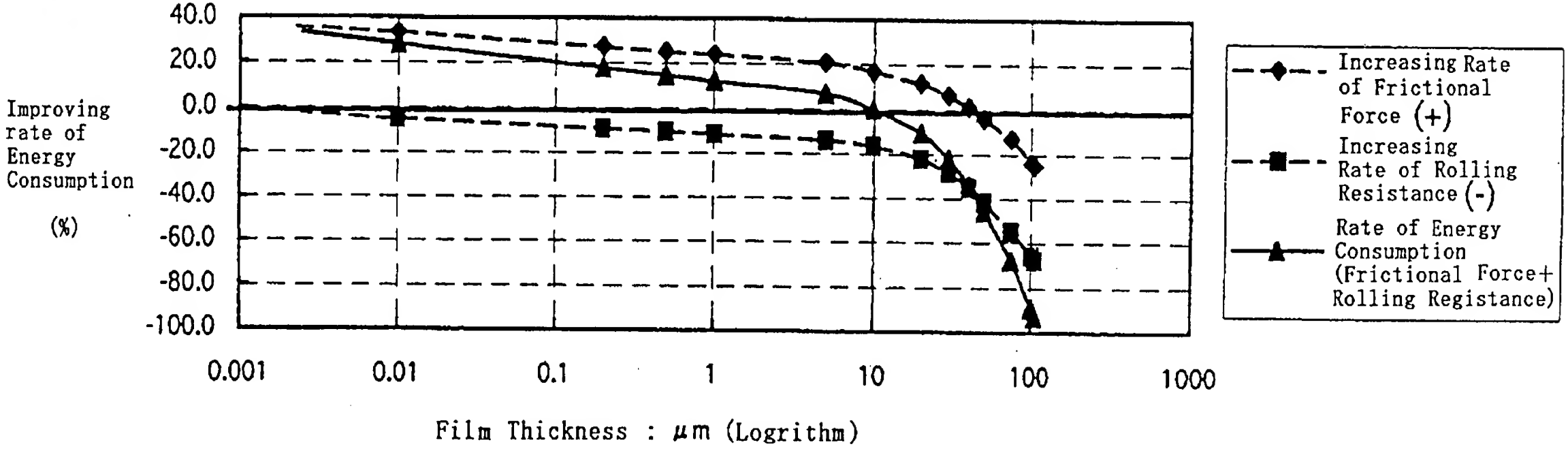
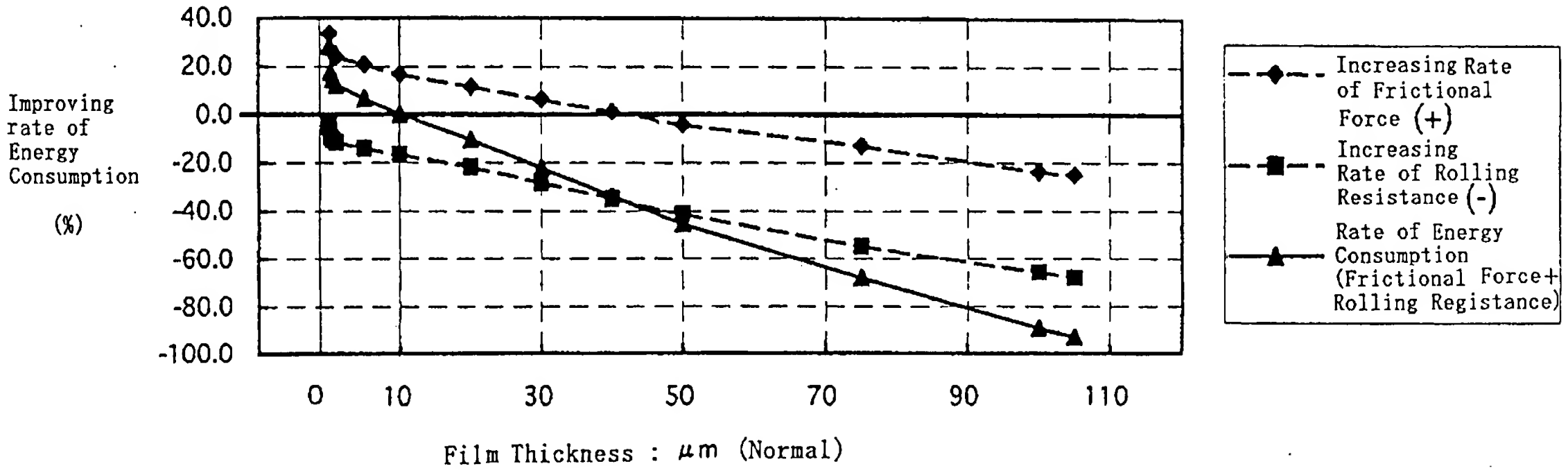


Fig.2 Relation between Improving Rate of Energy Consumption and Film Thickness



The thin film used in the experiment was prepared and applied to the tire surface in accordance with presently amended claim 28, as follows:
The film had a viscosity of 100,000 cp or less, and contained antislipping agents, the antislipping agents consisting of fine particles of an average particle diameter of 10μm or less. The film comprised a polymer binder selected from the group consisting of polyethylene; a methyl, phenyl, chloro, hydroxy, acetoxy, or cyano derivative of polyethylene; polybutadiene; a methyl or chloro derivative of polybutadiene; a copolymer of said polyethylene derivative and said butadiene derivative; silicone; polysulfide; polyurethane; modified silicone; modified epoxy resin; and modified acrylic resin.

I declare further that all statements made herein of may own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: September 15, 2005

Minoru Mukaida

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